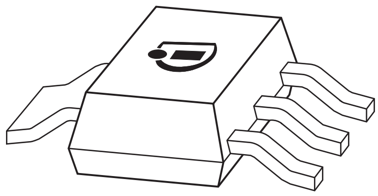
Voltage Regulator

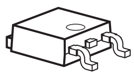
TLE 4274 / 3.3V;2.5V

Features

- Output voltage: 3.3 V/2.5 V ± 4%
- Current capability 400 mA
- Very low current consumption
- Short-circuit proof
- Reverse polarity proof
- Suitable for use in automotive electronics



P-SOT223-4



P-TO252-3-1

Functional Description

The TLE 4274 / 3.3V;2.5V is a voltage regulator available in a SOT223 and TO252 package. The IC regulates an input voltage up to 40 V to V_{Qrated} = 3.3 V/2.5 V. The maximum output current is 400 mA. The IC is short-circuit proof and has a shutdown circuit protecting it against overtemperature. The TLE 4274 is also available as 5 V, 8.5 V and 10 V version. Please refer to the data sheet TLE 4274.

Dimensioning Information on External Components

The input capacitor C_I is necessary for compensating line influences. Using a resistor of approx. 1 Ω in series with C_I, the oscillating of input inductivity and input capacitance can be damped. The output capacitor C_Q is necessary for the stability of the regulation circuit. Stability is guaranteed for capacities $C_Q \geq 10$ µF with an ESR of ≤ 2.5 Ω within the operating temperature range.

Type	Ordering Code	Package
TLE 4274 GSV33	Q67006-A9289	P-SOT223-4-1
TLE 4274 DV33	Q67006-A9348	P-TO252-3-1
TLE 4274 GSV25	Q67006-A9359	P-SOT223-4-1

Circuit Description

The control amplifier compares a reference voltage to a voltage that is proportional to the output voltage and drives the base of the series transistor via a buffer. Saturation control as a function of the load current prevents any oversaturation of the power element. The IC also includes a number of internal circuits for protection against:

- Overload
- Overtemperature
- Reverse polarity

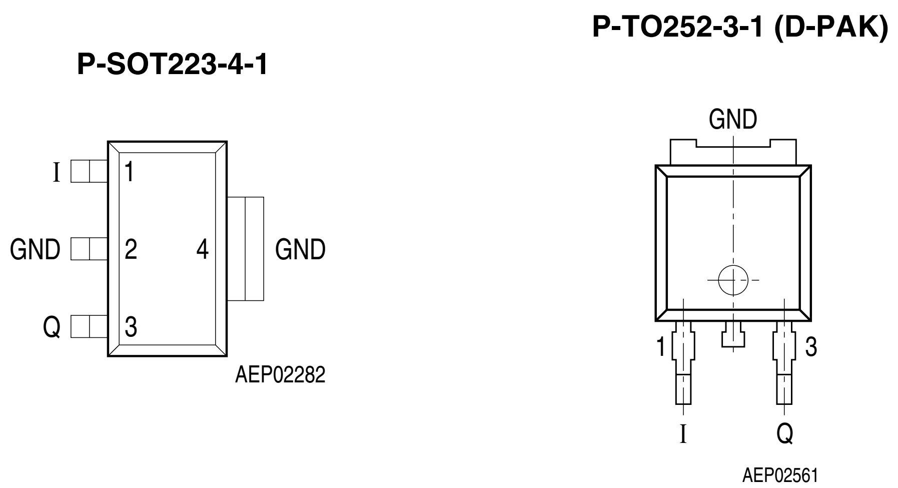


Figure 1 **Pin Configuration** (top view)

Table 1 **Pin Definitions and Functions**

Pin No.	Symbol	Function
1	I	**Input;** block to ground directly at the IC with a ceramic capacitor.
2, 4	GND	**Ground;** P-TO252-3-1: internally connected to heatsink
3	Q	**Output;** block to ground with capacitor $C_Q \geq 10\ \mu F$, ESR $\leq 2.5\ \Omega$

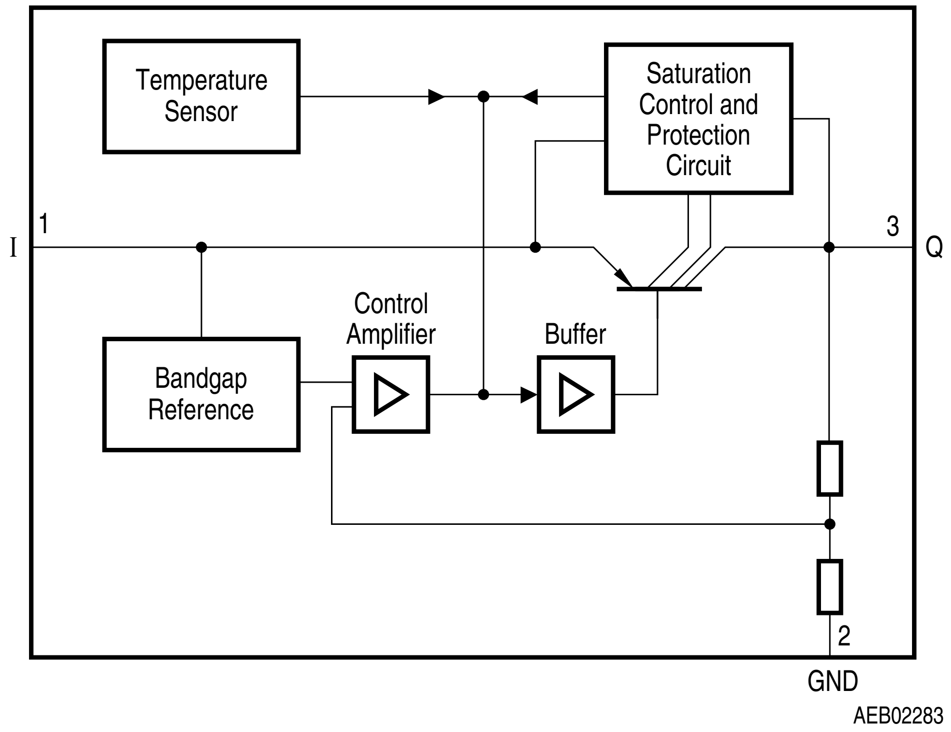


Figure 2 Block Diagram

Table 2 Absolute Maximum Ratings

T_j = -40 to 150 °C

Parameter	Symbol	Limit Values		Unit	Test Condition
		Min.	Max.		
Input					
Voltage	V_I	-42	45	V	–
Current	I_I	–	–	–	Internally limited
Output					
Voltage	V_Q	-1.0	40	V	–
Current	I_Q	–	–	–	Internally limited
Ground					
Current	I_{GND}	–	100	mA	–
Temperature					
Junction temperature	T_j	–	150	°C	–
Storage temperature	T_{stg}	-50	150	°C	–

Note: Maximum ratings are absolute ratings; exceeding any one of these values may cause irreversible damage to the integrated circuit.

Table 3 Operating Range

Parameter	Symbol	Limit Values		Unit	Remarks
		Min.	Max.		
Input voltage	V_I	4.7	40	V	–
Junction temperature	T_j	-40	150	°C	–
Thermal Resistance					
Junction ambient	R_{thja}	–	100	K/W	SOT223[1)]
Junction ambient	R_{thja}	–	70	K/W	TO252[2)]
Junction case	R_{thjc}	–	25	K/W	SOT223
Junction case	R_{thjc}	–	4	K/W	TO252

1) Soldered in, 1 cm^2 copper area at pin 4, FR4

2) Soldered in, minimal footprint, FR4

Table 4 Characteristics

V_I = 6 V; -40 °C < T_j < 150 °C (unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Measuring Condition
		Min.	Typ.	Max.		
Output voltage V33-Version	V_Q	3.17	3.3	3.44	V	5 mA < I_Q < 400 mA 4.7 V < V_I < 28 V
Output voltage V33-Version	V_Q	3.17	3.3	3.44	V	5 mA < I_Q < 200 mA 4.7 V < V_I < 40 V
Output voltage V25-Version	V_Q	2.4	2.5	2.6	V	5 mA < I_Q < 400 mA 4.7 V < V_I < 28 V
Output voltage V25-Version	V_Q	2.4	2.5	2.6	V	5 mA < I_Q < 200 mA 4.7 V < V_I < 40 V
Output current limitation[1)	I_Q	400	600	–	mA	–
Current consumption; $I_q = I_I - I_Q$	I_q	–	100	220	µA	I_Q = 1 mA
Current consumption; $I_q = I_I - I_Q$	I_q	–	8	15	mA	I_Q = 250 mA
Current consumption; $I_q = I_I - I_Q$	I_q	–	20	30	mA	I_Q = 400 mA
Drop voltage[1) V33-Version	V_{dr}	–	0.7	1.2	V	I_Q = 300 mA $V_{dr} = V_I - V_Q$
Drop voltage[1) V25-Version	V_{dr}	–	1.0	2.0	V	I_Q = 300 mA $V_{dr} = V_I - V_Q$
Load regulation	ΔV_Q	–	40	70	mV	I_Q = 5 mA to 300 mA; V_I = 6 V
Line regulation	ΔV_Q	–	10	25	mV	ΔV_I = 12 V to 32 V I_Q = 5 mA
Power supply ripple rejection	$PSRR$	–	60	–	dB	f_r = 100 Hz; V_r = 0.5 Vpp
Temperature output voltage drift	dV_Q/dT	–	0.5	–	mV/K	–

1) Measured when the output voltage V_Q has dropped 100 mV from the nominal value obtained at V_I = 6 V.

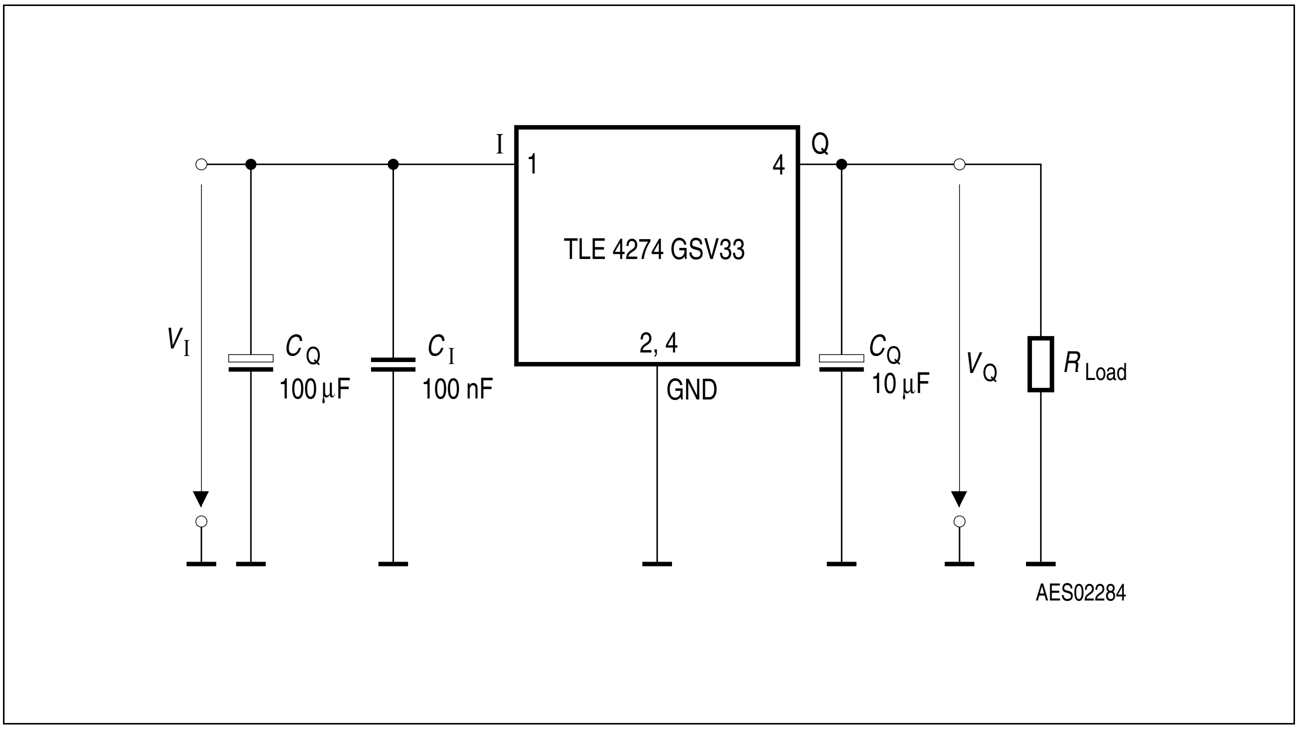


Figure 3 Measuring Circuit

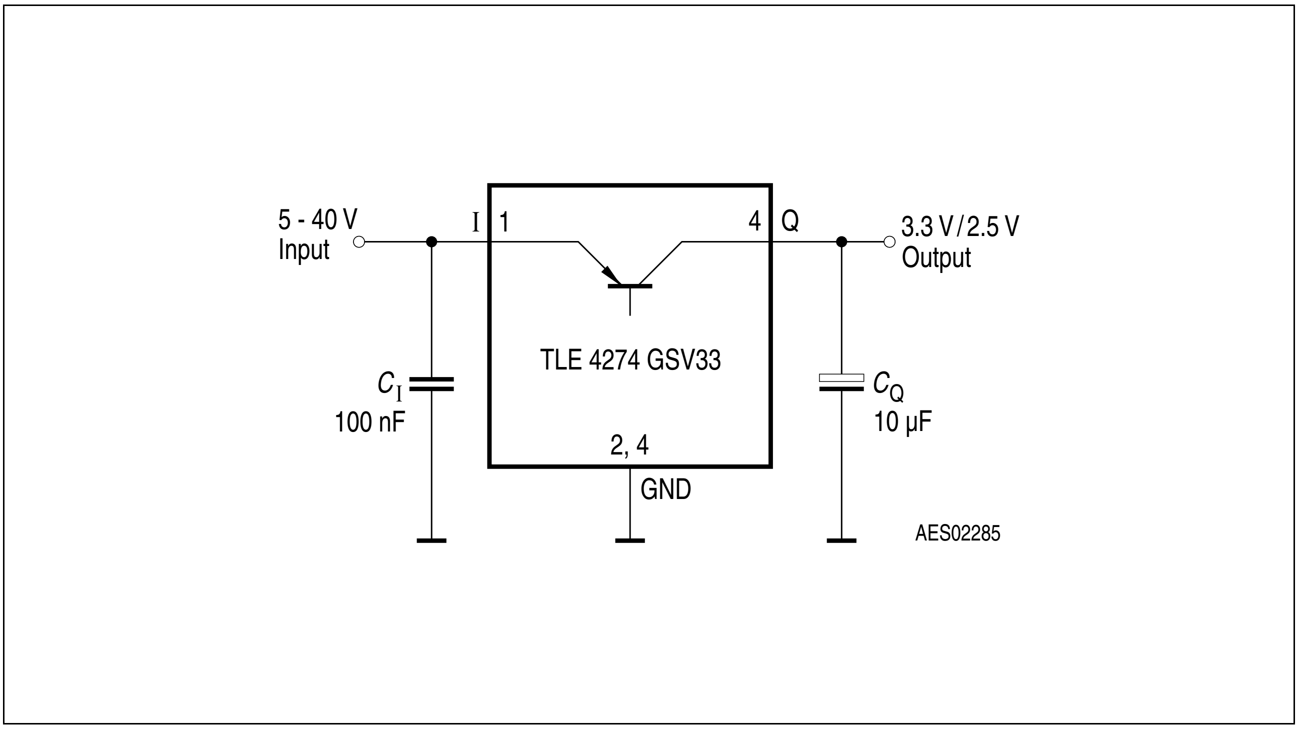


Figure 4 Application Circuit

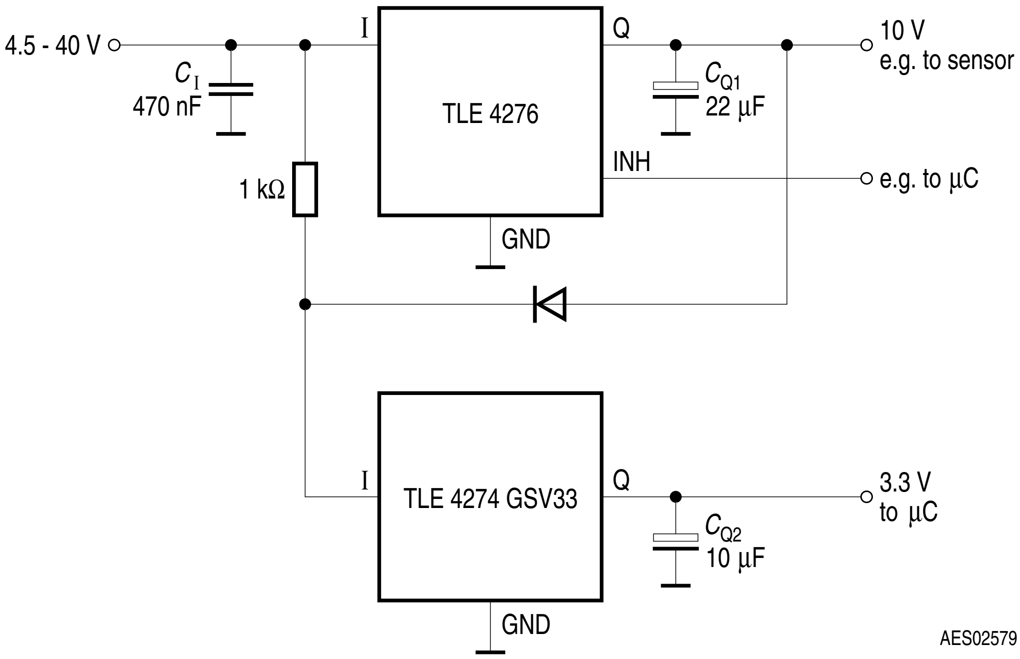
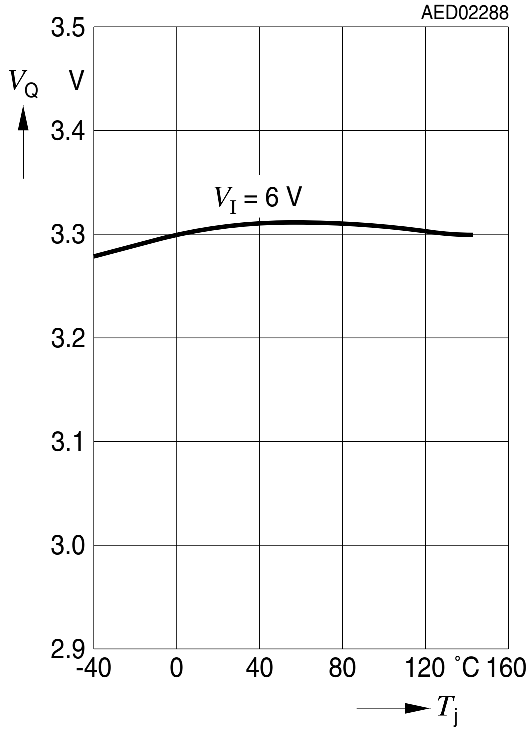


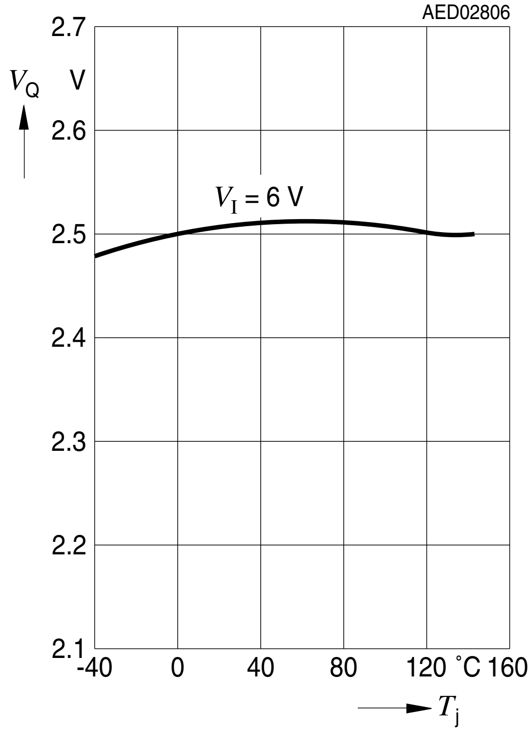
Figure 5 Application Example

Typical Performance Characteristics

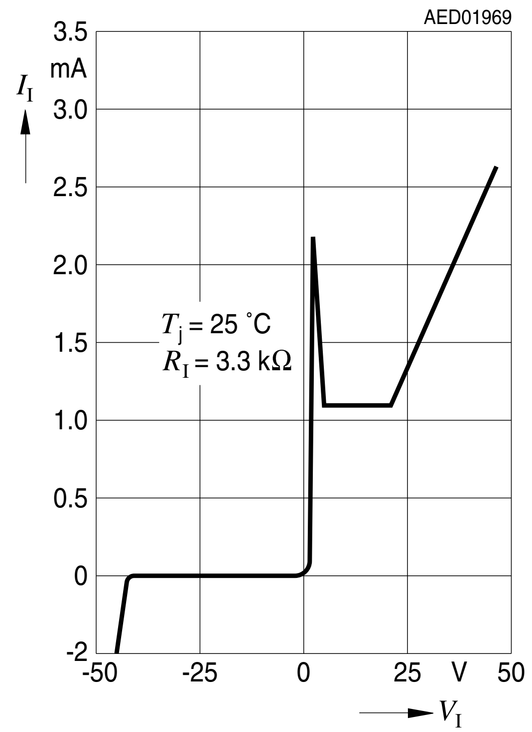
Output Voltage V_Q versus Junction Temperature T_j (V33-Version)



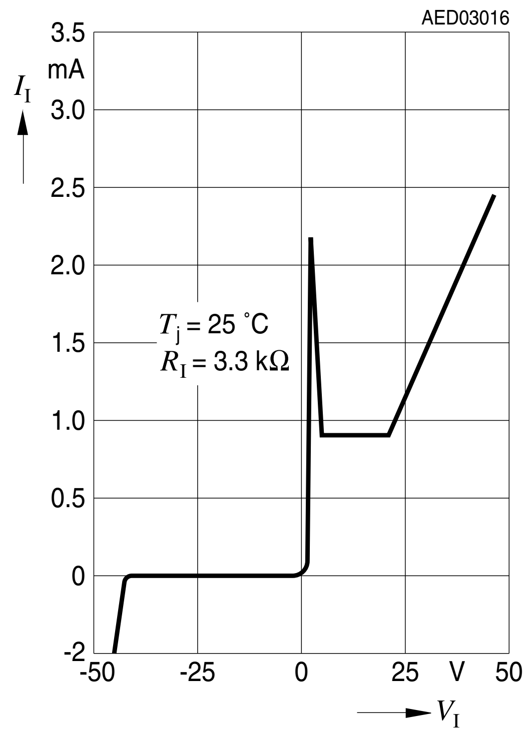
Output Voltage V_Q versus Junction Temperature T_j (V25-Version)



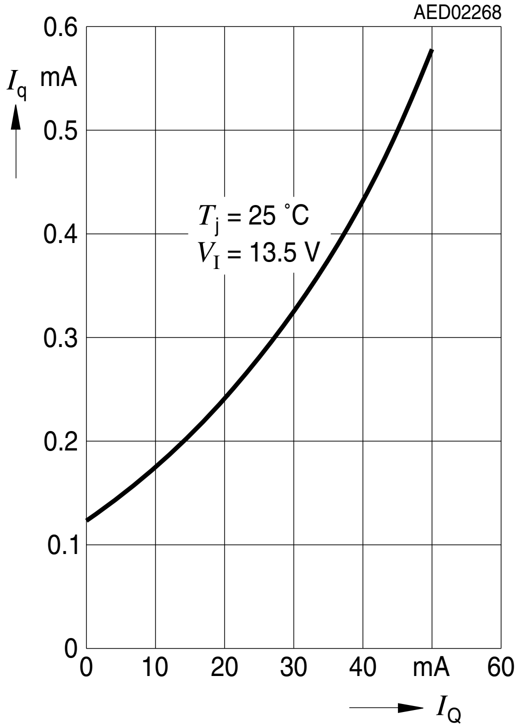
Input Current I_q versus Input Voltage V_I (V33-Version)



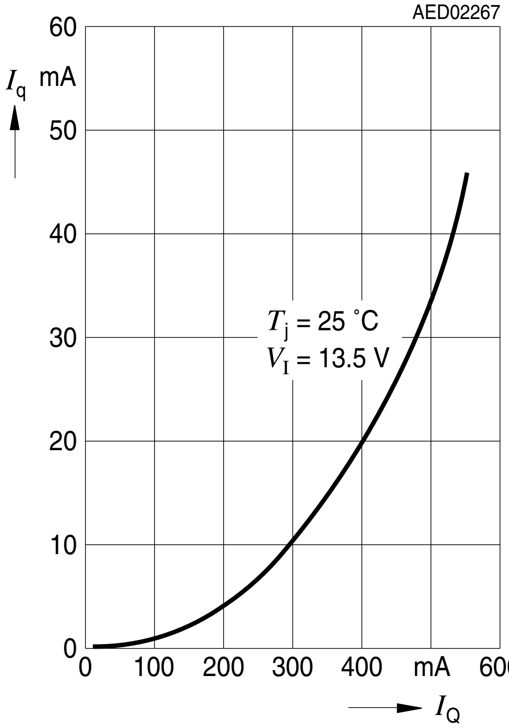
Input Current I_q versus Input Voltage V_I (V25-Version)



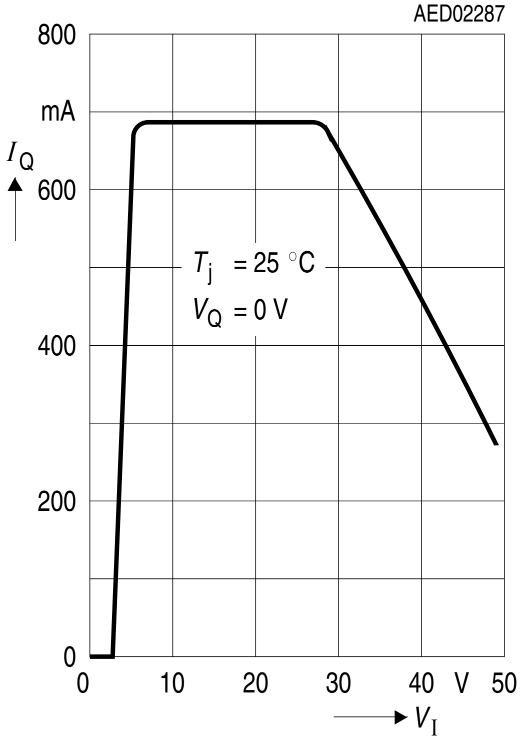
Current Consumption I_q versus Output Current I_Q (low load)



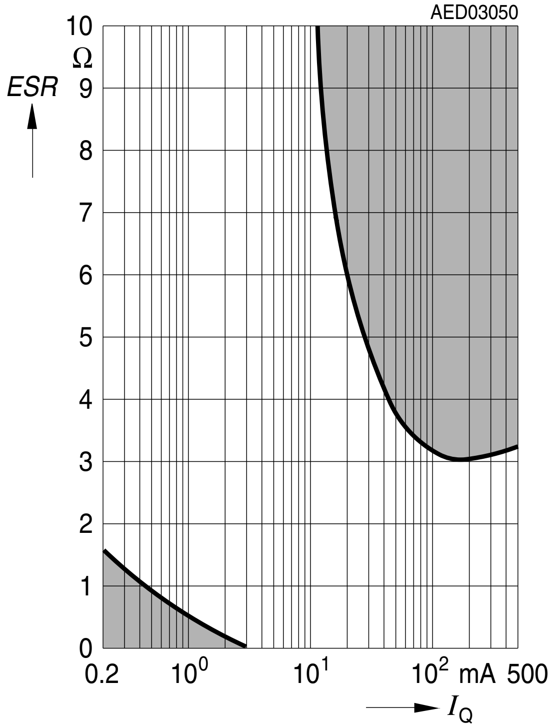
Current Consumption I_q versus Output Current I_Q (high load)



Output Current I_Q versus Input Voltage V_I



Region of Stability for C_Q = 10 µF



Package Outlines

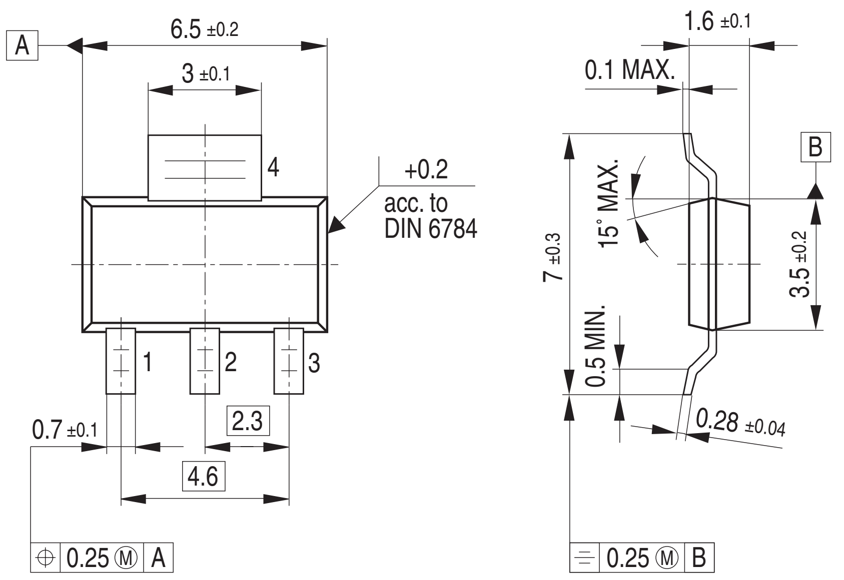


Figure 6 **P-SOT223-4-1** (Plastic Small Outline Transistor)

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SMD = Surface Mounted Device

Dimensions in mm

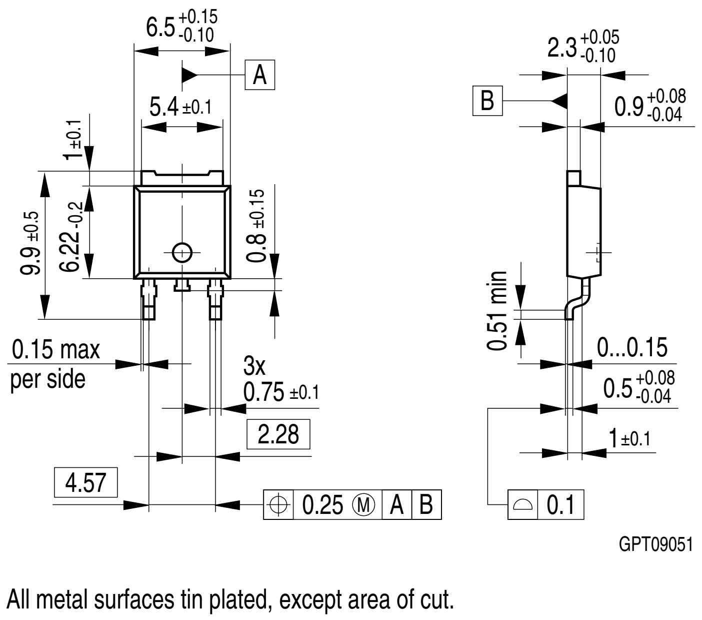

Figure 7 **P-TO252-3-1** (Plastic Transistor Single Outline)

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SMD = Surface Mounted Device

Dimensions in mm

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